

WHAT IS CLAIMED IS:

1. A thermally responsive composition comprising:
a thermally responsive viscosity modifier;
a polymerizable component different than the modifier; and
water.
2. The composition of claim 1 wherein the thermally responsive viscosity modifier comprises a poly(oxyalkylene) polymer.
3. The composition of claim 1 wherein the polymerizable component is selected from the group consisting of an ethylenically unsaturated compound, a glass ionomer cement, and combinations thereof.
4. The composition of claim 1 wherein the polymerizable component is a free radically polymerizable compound.
5. The composition of claim 4 wherein the compound is selected from the group consisting of a monomeric compound, an oligomeric compound, a polymeric compound, and combinations thereof.
6. The composition of claim 4 wherein the compound comprises a plurality of polymerizable groups.
7. The composition of claim 1 further comprising an initiator.
8. The composition of claim 7 wherein the initiator is a photoinitiator.
9. The composition of claim 7 wherein the initiator is a free radical initiator.
10. The composition of claim 1 further comprising an oxidizing agent and a reducing agent.

11. The composition of claim 2 wherein the poly(oxyalkylene) polymer comprises a reactive group.
12. The composition of claim 11 wherein the reactive group is selected from the group consisting of an ethylenically unsaturated group, an acidic group, and combinations thereof.
13. The composition of claim 11 wherein the reactive group is a free radically reactive group.
14. The composition of claim 11 wherein the reactive group is attached to an end of the poly(oxyalkylene) polymer.
15. The composition of claim 1 wherein the composition is a dental composition suitable for use in the oral environment.
16. The composition of claim 1 wherein the composition is a medical composition suitable for use in or on a body.
17. The composition of claim 1 wherein the composition is in a form selected from the group consisting of a dispersion, a suspension, an emulsion, a solution, and combinations thereof.
18. The composition of claim 1 further comprising an additive.
19. The composition of claim 18 wherein the additive is selected from the group consisting of fluoride sources, whitening agents, anticaries agents (e.g., xylitol), remineralizing agents (e.g., calcium phosphate compounds), enzymes, breath fresheners, anesthetics, clotting agents, acid neutralizers, chemotherapeutic agents, immune response modifiers, medicaments, indicators, dyes, pigments, wetting agents, surfactants, buffering agents, viscosity

modifiers, thixotropes, fillers, polyols, antimicrobial agents, antifungal agents, stabilizers, agents for treating xerostomia, desensitizers, and combinations thereof.

20. The composition of claim 18 wherein the additive is a whitening agent selected from the group consisting of a hypochlorite, a peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

21. A thermally responsive composition comprising:
a thermally responsive viscosity modifier;
1% by weight to 60% by weight of a polymerizable component different than the modifier, based on the total weight of the composition; and
water.

22. A thermally responsive composition comprising:
10% by weight to 50% by weight of a thermally responsive viscosity modifier comprising a poly(oxyalkylene) polymer, based on the total weight of the composition;
a polymerizable component different than the modifier; and
water.

23. A method of treating a surface comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the surface, the composition comprising a thermally responsive viscosity modifier, a polymerizable component different than the modifier, and water; and
allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state.

24. The method of claim 23 wherein the surface is the surface of a body.

25. The method of claim 23 wherein the surface is an oral surface.
26. The method of claim 23 wherein the viscosity of the composition at the treatment temperature is at least 5 times the viscosity of the composition at the pre-treatment temperature.
27. The method of claim 23 further comprising reducing the viscosity of the composition from the highly viscous state.
28. The method of claim 23 wherein reducing the viscosity comprises cooling the composition below the treatment temperature.
29. A method of hardening a composition on a surface comprising:
 - applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the surface, the composition comprising a thermally responsive viscosity modifier, a polymerizable component different than the modifier, and water;
 - allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state; and
 - inducing the polymerizable component to polymerize.
30. The method of claim 29 wherein the surface is the surface of a body.
31. The method of claim 29 wherein the surface is an oral surface.
32. The method of claim 29 wherein inducing polymerization comprises irradiating the composition.
33. The method of claim 29 wherein inducing polymerization comprises irradiating the composition with visible or ultraviolet light.

34. The method of claim 29 wherein inducing polymerization comprises introducing one or more additional components.
35. The method of claim 29 wherein the thermally responsive viscosity modifier comprises a poly(oxyalkylene) polymer.
36. The method of claim 35 wherein the poly(oxyalkylene) polymer comprises a reactive group.
37. The method of claim 36 wherein the reactive group is selected from the group consisting of an ethylenically unsaturated group, an acidic group, and combinations thereof.
38. The method of claim 36 wherein the reactive group is a free radically reactive group.
39. The method of claim 36 wherein the reactive group is attached to an end of the poly(oxyalkylene) polymer.
40. The method of claim 29 wherein the composition further comprises an initiator.
41. The method of claim 40 wherein the initiator is a photoinitiator.
42. The method of claim 40 wherein the initiator is a free radical initiator.
43. The method of claim 29 wherein the composition further comprises an oxidizing agent and a reducing agent.
44. The method of claim 30 wherein the body is a human body.

45. The method of claim 29 wherein the thermally responsive composition further comprises an additive.

46. The method of claim 45 wherein the additive is selected from the group consisting of fluoride sources, whitening agents, anticaries agents (e.g., xylitol), remineralizing agents (e.g., calcium phosphate compounds), enzymes, breath fresheners, anesthetics, clotting agents, acid neutralizers, chemotherapeutic agents, immune response modifiers, medicaments, indicators, dyes, pigments, wetting agents, surfactants, buffering agents, viscosity modifiers, thixotropes, fillers, polyols, antimicrobial agents, antifungal agents, stabilizers, agents for treating xerostomia, desensitizers, and combinations thereof.

47. The method of claim 45 wherein the additive is a whitening agent selected from the group consisting of a hypochlorite, a peroxide, a hydroperoxide, hydrogen peroxide, a peracid, carbamide peroxide, and combinations thereof.

48. The method of claim 29 wherein applying the composition comprises delivering the composition through an orifice.

49. The method of claim 48 wherein the orifice is the orifice of a syringe.

50. The method of claim 29 wherein applying the composition is selected from the group consisting of painting the composition, brushing the composition, syringing the composition, misting the composition, spraying the composition, applying a substrate having the composition thereon, and combinations thereof.

51. The method of claim 29 wherein the thermally responsive composition comprises two or more parts, and wherein applying the composition comprises combining the two or more parts.

52. The method of claim 51 wherein combining comprises using a static mixing device.

53. The method of claim 29 wherein the viscosity of the composition at the treatment temperature, before inducing the polymerizable component to polymerize, is at least 5 times the viscosity of the composition at the pre-treatment temperature.

54. The method of claim 29 wherein the viscosity of the composition at the treatment temperature, after inducing the polymerizable component to polymerize, is at least 10 times the viscosity of the composition at the pre-treatment temperature.

55. The method of claim 29 wherein the pre-treatment temperature is at most room temperature.

56. The method of claim 29 wherein the treatment temperature is body temperature.

57. A method of treating an oral surface of a body comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier, a polymerizable component, and water; and
allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state.

58. A method of hardening a composition on an oral surface of a body comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier, a polymerizable component, and water;

allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state; and inducing the polymerizable component to polymerize.

59. The method of claim 58 wherein the oral surface is selected from the group consisting of bone, tooth, tongue, gingiva, throat, and combinations thereof.

60. A method of making a thermally responsive viscosity modifier comprising reacting a hydroxy-terminated poly(oxyalkylene) polymer with an isocyanate-functional (meth)acrylate or a vinyl azlactone.

61. A thermally responsive viscosity modifier comprising a poly(oxyalkylene) polymer comprising at least one $\text{CH}_2=\text{C}(\text{R})\text{C}(\text{O})\text{OCH}_2\text{CH}_2\text{NHC}(\text{O})\text{O}-$ group on an end of the poly(oxyalkylene) polymer, wherein R represents H or CH_3 .

62. The thermally responsive viscosity modifier of claim 61 wherein the poly(oxyalkylene) polymer comprises a $\text{CH}_2=\text{C}(\text{R})\text{C}(\text{O})\text{OCH}_2\text{CH}_2\text{NHC}(\text{O})\text{O}-$ group on each end of the poly(oxyalkylene) polymer, wherein R represents H or CH_3 .

63. A thermally responsive viscosity modifier comprising a poly(oxyalkylene) polymer comprising at least one $\text{CH}_2=\text{CHC}(\text{O})\text{NHC}(\text{CH}_3)_2\text{C}(\text{O})\text{O}-$ group on an end of the poly(oxyalkylene) polymer.

64. The thermally responsive viscosity modifier of claim 63 wherein the poly(oxyalkylene) polymer comprises a $\text{CH}_2=\text{CHC}(\text{O})\text{NHC}(\text{CH}_3)_2\text{C}(\text{O})\text{O}-$ group on each end of the poly(oxyalkylene) polymer.

65. A thermally responsive composition comprising:
a thermally responsive viscosity modifier according to claim 61; and
water.

66. A method of treating an oral surface of a body comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier according to claim 61 and water; and
allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state.

67. A method of hardening a composition on an oral surface of a body comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier according to claim 61 and water;
allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state; and
inducing the modifier to polymerize.

68. A thermally responsive composition comprising:
a thermally responsive viscosity modifier according to claim 63; and
water.

69. A method of treating an oral surface of a body comprising:
applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier according to claim 63 and water; and
allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state.

70. A method of hardening a composition on an oral surface of a body comprising:

applying a thermally responsive composition in a low viscosity state at a pre-treatment temperature to the oral surface, the composition comprising a thermally responsive viscosity modifier according to claim 63 and water;

allowing the composition to warm to a treatment temperature and increase in viscosity to a highly viscous state; and

inducing the modifier to polymerize.